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Draft Natural Resource Damages Restoration Plan and Environmental Assessment for the John Heinz National Wildlife Refuge at Tinicum



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1.0 Introduction: Purpose and Need for Restoration

This document includes the draft Restoration Plan and Environmental Assessment (RP/EA) on proposed restoration actions associated with two natural resource damage settlements for incidents on and nearby the John Heinz National Wildlife Refuge (JHNWR) at Tinicum, located in Philadelphia and Delaware Counties, Pennsylvania. This document was prepared by the U. S. Fish and Wildlife Service's (USFWS) Pennsylvania Field Office in close coordination with the JHNWR staff. The purpose of this document is to address the restoration of natural resources injured by the release of 191,982 gallons of crude oil within the JHNWR and the release of hazardous materials associated with the Publiker Industries Inc. National Priorities List Superfund Site.

This RP/EA will describe alternatives for restoring resources injured as a result of the crude oil release and the services these resources provided using funds collected as natural resource damages for these injuries, pursuant to the Oil Pollution Act (OPA) of 1990 (33 U.S.C. *et seq.*). In addition, this RP/EA will also address the restoration of resources injured, impaired, or lost by the release of hazardous substances into the environment associated with the Publiker Superfund Site. Damages collected from the settlement will be used to restore equivalent natural resources injured, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, commonly known as Superfund, (42 U.S.C. 9601 *et seq.*).

OPA and CERCLA require that the environment and the public be made whole for injuries to natural resources and services resulting from the release of oil or a hazardous material into the environment. This goal is accomplished through the Natural Resource Damage Assessment and Restoration (NRDAR) process by: 1) returning injured natural resources and services to their baseline (pre-incident) condition, and 2) compensating for the interim loss of natural resources and services from the time of the injury until recovery is complete.

OPA and CERCLA outline a process for evaluating and selecting appropriate compensatory restoration actions. This RP/EA identifies and evaluates proposed compensatory restoration options for addressing lost ecological services from the result of the oil contamination at JHNWR, and the hazardous substance contamination at Publiker.

1.1 Authorities

The USFWS, acting as Trustee, prepared this draft RP/EA to fulfill requirements under OPA and CERCLA. In addition, this document constitutes an environmental assessment as defined under the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*).

Authority for NRDAR also falls under the Federal Water Pollution Control Act of 1972, as amended, commonly referred to as the Clean Water Act (33 U.S.C. 1251 *et seq.*). Additionally, the USFWS serves as the Federal land managing agency with sole responsibility for the protection, operation and maintenance of the JHNWR, including all air, water, sediments and biota located thereon, as a unit of the National Wildlife Refuge System (40 C.F.R. section 300.600(a)(3)).

Other natural resource and environmental laws and regulations considered during the development of this RP/EA include: the Endangered Species Act of 1973, 16 U.S.C. 1531 *et seq.*; the Coastal Zone Management Act of 1972, 16 U.S.C. 1451 *et seq.*; the Migratory Bird Treaty Act, 16 U.S.C. 703 *et seq.*; the National Historic Preservation Act, 12 U.S.C. 470 *et seq.*; the Archaeological Resources Protection Act, 16 U.S.C. 470 *et seq.*; the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (PL 105-57) 16 U.S.C. 668dd *et seq.*; the Wilderness Act of 1964, 16 U.S.C. 1131 *et seq.*; the Fish and Wildlife Coordination Act of 1934, 16 U.S.C. 661 *et seq.*; the Refuge Recreation Act of 1962, 16 U.S.C. 460k *et seq.*; and, the U. S. Fish and Wildlife Mitigation Policy of 1981. Restoration options/alternatives described in this document will be conducted in compliance with all applicable State, Federal, and local regulations.

1.2 Trustee Responsibilities under OPA, CERCLA, and NEPA

The U.S. Fish and Wildlife Service is a designated Federal Trustee for natural resources including migratory birds, anadromous fish, endangered species and their respective habitats, and Federal lands managed by the Department of the Interior (Executive Order 12580 (40 CFR 300.000)). The USFWS is the natural resource Trustee responsible for restoring natural resources injured at the JHNWR.

Under OPA and CERCLA, Trustees are authorized to conduct natural resource damage assessments and develop a plan for restoration of injured natural resources and services. OPA and CERCLA require that the Trustees must develop a Draft and Final Restoration Plan, with an opportunity for public review and comment on the Draft Plan. The plan must include a reasonable number of restoration alternatives including selection of the preferred alternative.

In addition, under NEPA, Federal agencies must identify and evaluate environmental impacts that may result from Federal actions (42 U.S.C. 4321 *et seq.*). Federal agencies may prepare an Environmental Assessment (EA) to facilitate such an evaluation. A RP/EA integrates NEPA requirements by: summarizing the affected environment, describing the purpose and need for action, identifying alternative actions, assessing each alternative's applicability and environmental consequences, and summarizing opportunities for public participation in the decision process. When appropriate and on a site-specific basis, the Service will conduct additional NEPA analyses and make those analyses publicly available.

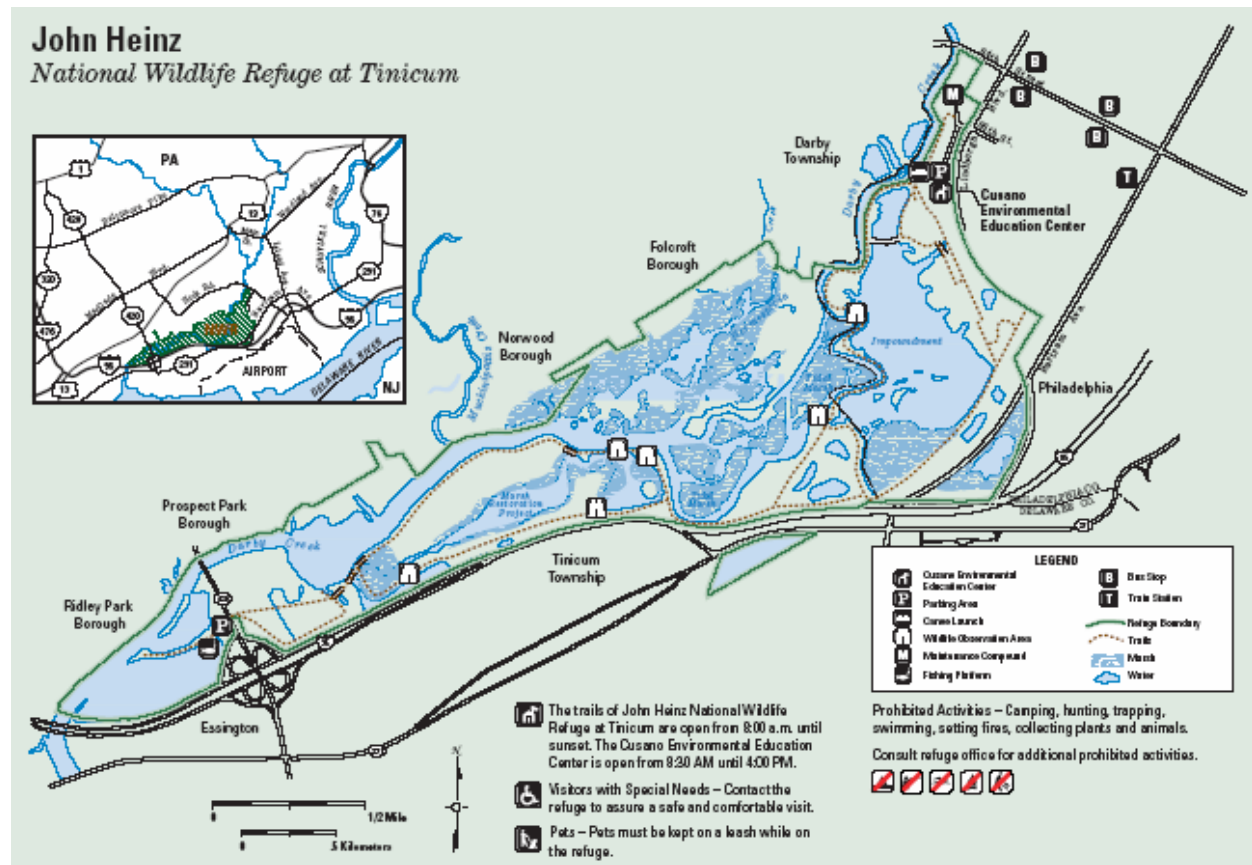
1.3 Affected Area

1.3.1 Site Description

John Heinz National Wildlife Refuge

The JHNWR is located in Philadelphia and Delaware Counties, about one mile north of the Philadelphia International Airport (Figure 1). The Refuge is located downstream from Darby and Cobbs Creek (Cobbs Creek joins with Darby Creek about one mile upstream from the Refuge). Both watersheds drain a largely urbanized region containing numerous stormwater discharges, large areas of imperviousness, combined sewer outfalls (Cobbs only), and eight permitted industrial and municipal wastewater discharges. The Refuge is located upstream from the tidal Delaware River, and water from the river reaches the Refuge during high tide.

Figure 1. John Heinz National Wildlife Refuge at Tinicum.



Under legislation passed by Congress in 1972, authorization was given to the Secretary of the Interior to acquire 1,200 acres to establish the Tinicum National Environmental Center. In November 1991, in a bill sponsored by Congressman Curt Weldon (R-PA), the name of the refuge was changed to John Heinz National Wildlife Refuge at Tinicum to honor the late Senator

who helped preserve Tinicum Marsh. In keeping with the overall mission of the National Wildlife Refuge System, the JHNWR has recognized three major goals (USFWS 1977): 1) To preserve the natural resources of the Refuge which contains the largest freshwater tidal marsh that remains in Pennsylvania; 2) To provide environmental education opportunities for the schools and residents of the surrounding region; and 3) To provide quality wildlife-oriented recreation opportunities for the enjoyment of people in the surrounding region when it will not interfere with the primary purpose for which the area was established.

Historically, freshwater tidal wetlands in the Philadelphia area measured over 5,700 acres. All but 200 acres of these wetlands have been lost or degraded by human actions, including diking, dredging, and filling activities. The remaining 200 acres, which represent 80% of Pennsylvania's coastal wetlands, are protected by the Refuge. In addition to wetlands, the Refuge contains open water, grassland, and riparian and upland forested habitats.

The Refuge represents a critical stopover for migratory birds, including warblers, egrets, sandpipers, and a large variety of ducks along the Atlantic Flyway. More than 280 species of birds, 80 of which have been observed nesting at the Refuge, have been documented (USFWS 1983). Forty species of fish occur within the Refuge's waters, including anadromous American shad (*Alosa sapidissima*) and catadromous American eel (*Anguilla rostrata*). Eight species of amphibians and eighteen species of reptiles have also been reported to occur at the Refuge, including two Pennsylvania State-listed threatened and endangered species, the red-bellied turtle (*Pseudemys rubriventris*) and the coastal plain leopard frog (*Rana sphenoccephala*) (USFWS 1983).

In 1983, the USFWS completed a master plan for the JHNWR to outline the primary goals for habitat management at the Refuge. The plan listed four guidelines:

- 1) The existing tidal wetlands will be managed to maintain their integrity and to enhance productivity.
- 2) Where considered environmentally suitable, areas that were formerly tidal wetlands, will be restored and managed as tidal wetlands.
- 3) Areas of open, non-tidal water will be retained or established at appropriate locations to provide habitat for migratory and resident waterfowl and fish, and to provide areas for educational, wildlife-oriented recreation activities or scientific research.
- 4) At appropriate locations, areas will be developed and managed to facilitate scientific research on habitat restoration and/or wildlife management, and to provide educational demonstrations of these techniques.

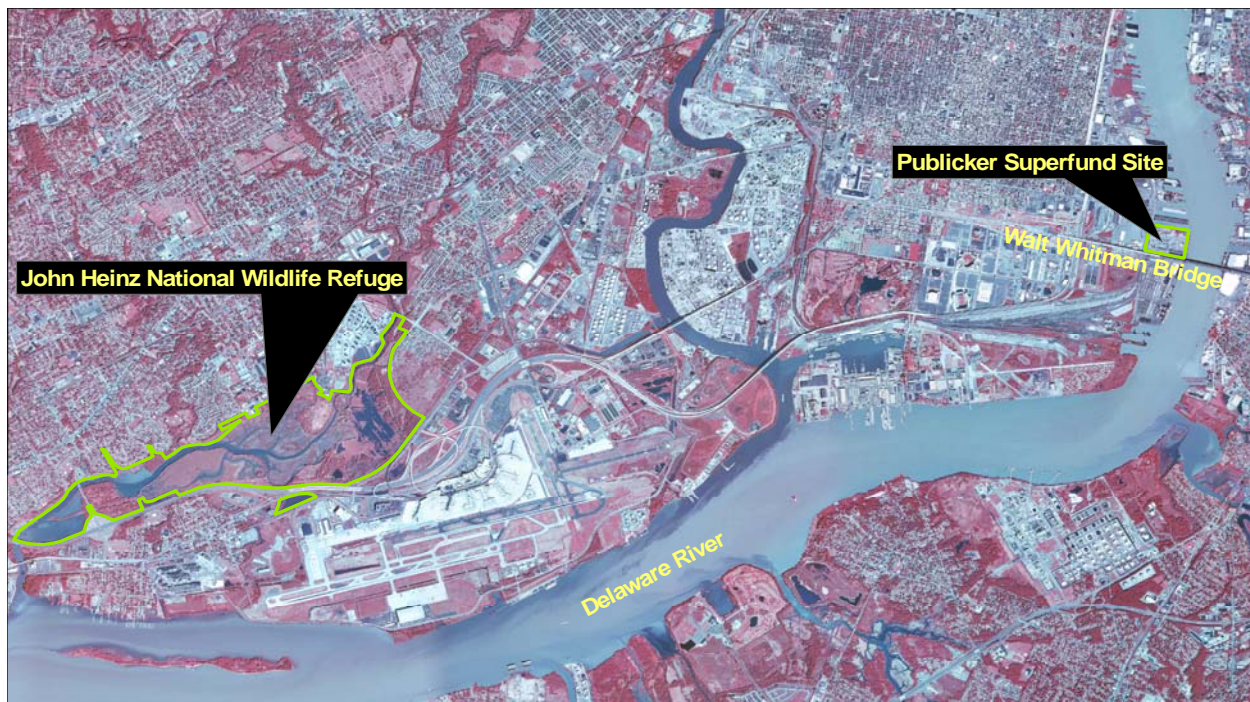
Publicker Industries Inc. Superfund Site

The Publicker site is a former liquor/alcohol distillery bordering the Delaware River, and is located approximately 7 miles upstream from the JHNWR (Figure 2). The site was approximately 37 acres in size and contained the remains of nearly 440 structures, including large tanks, storage drums, product stock, chemical laboratories, reaction vessels, production buildings, warehouses, and power plants.

Publicker Industries, Inc. owned and operated a liquor and industrial alcohol manufacturing plant at the site from 1912 to late 1985. The site was also used as a petroleum product storage facility during the late 1970s and early 1980s. Numerous chemicals were manufactured or stored at the site during plant operations, which ceased in February 1986.

In June 1987, a fire destroyed a portion of the site. After the fire, the Environmental Protection Agency (EPA) observed numerous spill areas, improper drum storage, a leaking process line, and an oily sheen emanating from the site into the Delaware River. In 1987 and 1988, EPA performed emergency removal and combined removal/remedial actions. The Publicker site was

Figure 2. The Publicker Industries Inc. Superfund Site is located seven miles upstream from the John Heinz National Wildlife Refuge.



added to the National Priorities List in May 1989, and a Record of Decision (ROD) for the site stabilization was completed in June 1989. Since then, the site has been cleaned up by the EPA and deleted from the National Priorities List in November 2000. Prior to the cleanup, however,

many hazardous contaminants were leached into the environment, including: arsenic, chromium, copper, lead, mercury, zinc, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs).

1.3.2 Natural Resource Injury

John Heinz National Wildlife Refuge

Natural resource injury is a measurable adverse change, either long- or short-term, in the chemical or physical quality or the viability of a natural resource resulting from either direct or indirect exposure to a discharge of oil or release of a hazardous substance (43 CFR 11.14(v)). Injuries can include effects caused by the exposure and effects caused by remedial actions (43 CFR 11.15(a)(1) and 15 CFR 990.51(b)(2)(ii)).

On or about February 2, 2000, a subsurface pipeline owned by Sun Pipeline Company and operated by Sunoco, Inc. (R&M) ruptured at a mitered joint, releasing 191,982 gallons of crude oil into a freshwater wetland impoundment and its adjoining shoreline within the JHNWR. Natural resource injuries associated with the spill and its clean-up included injured wetland and upland habitats, lost visitor use, reduced public perception, and the degradation of a service road. Sunoco funded the Natural Resource Damage Assessment (NRDA) primary restoration activities which included restoring: 1) oiled wetland, riparian, and upland habitat; 2) the service road and adjacent habitat; and 3) an upland meadow injured by clean-up action. Injured acreage by habitat included:

	Acres
Emergent Wetland	0.149
Shrub-Scrub Wetland	0.544
Wet Depression	0.770
Forested Wetland	0.453
Open Water	2.169
Shrub-Scrub/Forested	0.023
Upland	0.604
Meadow	1.169
Total	5.881

The USFWS has trust resources (Federal lands and migratory bird habitat) which were injured by hazardous substances released from the spill. The physical extent of contamination was clearly documented, and acute biological impacts were evident (approximately 20 oiled turtles and several dozen dead fish were documented).

Sunoco, in conjunction with the natural resource trustees, implemented a phased program of primary restoration in order to return the injured habitats and natural resources to their baseline condition. Although the purpose of primary restoration is to restore injured habitats and natural resources to baseline condition, these actions do not address the interim loss of ecological

services that occur from the time of the injury until recovery to baseline is complete. Therefore, compensatory restoration actions are required to fully satisfy OPA goals.

Publicker Industries Inc. Superfund Site

The U.S. Fish and Wildlife Service, acting as Natural Resource Trustee, determined that there were injuries to trust resources (migratory birds and anadromous fish) at the Publicker site. Surface soils at the Publicker site were seriously contaminated by toxic organic chemicals and heavy metals. Ducks had been reported to use the drainage ditches on site, which were known to contain highly contaminated sediments. Clear pathways existed from the surface soils to the Delaware River, via overland runoff and the storm sewer system. Contaminants were assumed to have reached the Delaware River at concentrations sufficient to harm anadromous fish that may use the slips as nursery or foraging areas. The FWS settlement position for this site indicated that the best way to restore resources injured as a result of the hazardous substance releases was to create or restore freshwater tidal wetlands along the Delaware River. These areas serve as vital breeding, nesting, feeding and resting habitats for many species of migratory birds in the area and serve as nursery areas for anadromous fish.

1.3.3 Natural Resource Compensation

In July, 2005, Sunoco, Inc. (R&M) and Sun Pipeline Company reached a natural resource damages settlement in the amount of \$865,000 with the U.S. Department of the Interior (DOI), acting as natural resource Trustee, for natural resource injuries associated with the discharge of oil that occurred on February 2, 2000, at the JHNWR. Additionally, two settlement agreements were reached between the DOI and responsible parties from the Publicker site. The first settlement was reached in 1989 for the amount of \$40,000. The second settlement was reached in 1996, for the amount of \$497,000.

Because of the similar resource injuries associated with the sites, an opportunity exists to combine the Sunoco settlement funds with those acquired from the settlements from the nearby Publicker Superfund Site to create a larger-scale restoration action. Interest has accrued from all settlements, and some funds used for restoration planning have been debited from the accounts. Totalling all three settlement accounts, the current amount available for restoration is \$1,523,845.

1.4 Public Notification and Review

Under OPA, CERCLA, and NEPA, Trustees must involve the public in the restoration planning process. Accordingly, the Service is publishing, distributing, and seeking comments on this Draft Restoration Plan/Environmental Assessment. The Notice of Availability of the Draft Plan was published in the *Federal Register* and posted in a Press Release to local newspapers. A copy of this Draft Plan is also available for review during office hours and on-line at the following location:

U.S. Fish and Wildlife Service
John Heinz National Wildlife Refuge at Tinicum
8601 Lindbergh Boulevard
Philadelphia, PA 19153
Telephone: (215) 365-3118
<http://heinz.fws.gov>

Interested parties can also obtain an electronic or hard copy of the draft RP/EA from the Service at the following addresses:

Pennsylvania Field Office
U.S. Fish and Wildlife Service
315 S. Allen Street, Suite 322
State College, PA 16801
Telephone: (814) 234-4090

U.S. Fish and Wildlife Service
John Heinz National Wildlife Refuge at Tinicum
8601 Lindbergh Boulevard
Philadelphia, PA 19153
Telephone: (215) 365-3118

1.5 Comments on the Restoration Plan / Environmental Assessment

The USFWS believes that public comment and input is critical to the success of this RP/EA and will consider all comments received from the public. Comments received by the USFWS will be addressed in the Final Restoration Plan/Environmental Assessment. When appropriate, we will incorporate concepts and ideas submitted by interested parties during the public comment period. Comments will be accepted for approximately 30 days after the publication of the Notice of Availability in the *Federal Register*. **Comments must be received by November 25, 2006.** To provide comments, please provide your name, address, and telephone number, and send comments to:

Pennsylvania Field Office
U.S. Fish and Wildlife Service
315 S. Allen Street, Suite 322
State College, PA 16801

2.0 Description of Restoration Alternatives

Under OPA and CERCLA, trustees must identify and evaluate a reasonable number of restoration alternatives and select the preferred alternative, as part of the development of the Draft and Final Restoration Plan. Acceptable restoration actions include any of the actions authorized under OPA and CERCLA, which include: restoration, rehabilitation, replacement, or

acquisition of the equivalent natural resources to those injured, or some combination of those actions. Section 2.1 explains the criteria used to identify restoration alternatives. Sections 2.2 through 2.3.4 describe each alternative. Section 3.0 explains the criteria for evaluating and selecting the preferred alternative. Sections 3.1 through 3.2.4 evaluate each alternative. And Section 4.0 identifies the preferred restoration option.

2.1 Criteria for Identifying Restoration Alternatives

The primary goal of the USFWS, acting as Trustee, is to select a restoration alternative that compensates for injuries to trust resources (Federal lands and migratory bird habitat) as a result of the oil spill at JHNWR; and for injuries to trust resources (migratory birds and anadromous fish) as a result of the release of hazardous substances at Publicker. We identified the following as desirable characteristics for potential restoration projects: the restored habitat should provide similar services as that impacted by the release of oil and hazardous substances; the project should be located on the JHNWR; and the project should coincide with the primary goals of the JHNWR Master Plan (USFWS 1983). Additionally, visitor use and public perception were impacted from the oil release and associated cleanup. Public use elements are suggested in conjunction with each proposed restoration alternative in order to compensate for injuries incurred by the public.

2.2 Alternative A: No Action

This alternative is addressed to fulfill requirements under NEPA, and is consistent with the damage assessment process under the NRDAR regulations. Under the No Action Alternative, no restoration, rehabilitation, replacement, or acquisition actions would occur to compensate for resources injured.

2.3 Alternative B: On-site, In-kind Restoration at JHNWR

This alternative considers restoration projects at the JHNWR. Because of historical degradation and loss of wetlands on the Refuge, and because the Refuge contains the largest area of non-urban land use in the vicinity of the oil spill and contaminant release, all restoration alternatives considered, other than the No Action alternative, are those that would replace or restore natural resources on the Refuge.

2.3.1 Fill Removal at Filled Land Resource Planning Unit FL-3

This proposed restoration site is located between Darby Creek and Interstate 95 (I-95) just southwest of the impoundment (Figure 3). The site was referred to in the Tinicum National Environmental Center Master Plan (USFWS 1983) as Filled Land Resource Planning Unit FL-3. Though the entire planning unit is approximately 61 acres in size, this alternative would involve an area less than 20 acres in size in the southwestern portion of the unit.

Most of the land associated with FL-3 restoration area appears to be approximately 5 to 7 feet

above the normal high water line of daily tidal flows (Woodlot 2002). This area, formerly freshwater tidal wetland, was filled with dredge material (likely silts) from maintenance dredging operations in the Federal navigation channel between Philadelphia and the mouth of the Delaware River. The placement of fill material into FL-3 stopped in 1966 when the parcel was added to other lands managed by the City of Philadelphia as the Tinicum Wildlife Preserve. As a result of filling, most of the FL-3 area is upland habitat that was once tidal marsh.

Common reed (*Phragmites australis*) is the dominant plant growing throughout the proposed FL-3 restoration area, in places so dense it is difficult to walk through (Woodlot 2002). Scattered among the common reed are several types of trees, including mulberry (*Morus rubra*), tree of heaven (*Ailanthus altissima*), and honey locust (*Gleditsia triacanthos*), which are primarily less than 5 inches in diameter at breast height. Overall plant diversity is very low due to the dominance of common reed. Pieces of concrete rubble were observed protruding from the ground in scattered locations throughout the parcel, though the extent of demolition debris contained within the fill is unknown (Woodlot 2002).

Figure 3. Restoration Alternatives for JHNWR.



The main component of this alternative would involve the removal of existing fill to restore tidal wetland, replicating the depth and slope of the original wetland's creek and mudflat (Woodlot 2002). Fill would be excavated down to the elevation of the adjacent tidal marsh. Daily tidal flows would be provided by excavating a narrow breach in the dike to allow free movement of tidal waters into and out of the restored basin. A concrete water control structure with a screw-gate control would be installed in the breach to allow Refuge personnel to block flows into or out

of the basin in the event of a catastrophic oil spill, to control invasive plant species, and to manage water levels. The water control structure would include a fish passage in the design to allow anadromous fish access to the restored area. A chain link or similar fence would be installed at the water control structure for the safety of the public and Refuge personnel (Woodlot 2002).

This alternative could be accomplished under two different scenarios, referred to here as FL-3 Option A and Option B. Under Option A, all of the excavated fill would be disposed of on-site in accordance with Refuge management practices. One possibility would be to use the fill to create an 8-foot high vegetated earthen berm between the interstate and the restoration area which would function as a physical and audible barrier from the restoration site. Under Option B, all of the excavated material would be trucked off site for disposal at the Army Corp of Engineer's Fort Mifflin Mud Island dredge spoil bank, at the mouth of the Schuylkill River. If excavated material is trucked off site, coordination would be required with the Pennsylvania Department of Transportation (PennDOT) and Tinicum Township to secure temporary truck access to I-95 and Route 291. The selection of either Option A or B will be contingent on the results of contaminant sampling and associated contaminant levels found in the filled material.

Following excavation, dewatering (as needed), rough grading, and topsoil would be spread along the basin's banks to facilitate planting. It is anticipated that no topsoil would need to be added in the intertidal zone of the basin. Medium-duty erosion control blankets (*e.g.*, a 2-year coir and straw product with natural, biodegradable netting) would be installed to stabilize the banks and prevent sedimentation of the adjacent marsh as necessary. Anticipated earth moving equipment would include bulldozers, backhoes, and dump trucks.

The banks of the basin and other areas disturbed by construction would be seeded and planted with native species for long-term stabilization and naturalization of the site. Planted species would include a variety of herbaceous, shrub and tree species that would be visually attractive and also provide a source of mast, seed, and berry foods for wildlife. Based on experience from past restoration projects at the Refuge, it is anticipated that exclosure fencing would be needed to protect the planted stock until it is well established and less susceptible to mortality from waterfowl and deer browsing. It is assumed that the basin floor would not be planted, and that vegetation there would become established through volunteer growth. The existing seed bank and tidal flows into the basin would provide sources of seed for re-vegetation of the wetland basin, eliminating the expense of installing plants that would likely be destroyed by waterfowl (Woodlot 2002).

Lastly, a public viewing platform and an interpretive sign describing the restoration project would be installed adjacent to the site.

2.3.2 Dredging of the East Impoundment

Located on the eastern side of the Refuge (Figure 3) is a 145-acre impoundment that provides habitat for a wide variety of wildlife, including migratory waterfowl and other wetland

dependant birds, as well as Pennsylvania State-listed coastal plain leopard frogs and red-bellied turtles. The primary goal of this restoration alternative is to excavate deep-water areas within the impoundment to increase the open water habitat for waterfowl and in doing so, make it less favorable for the growth of yellow water lily or spatterdock (*Nuphar advena*), which currently forms a dense monotypic mat over most of the open water during the height of the growing season. The dense growth has diminished the value of the site for use by waterfowl by drastically reducing the amount of open water. It is also causing a rapid buildup of organic matter in the shallow impoundment because of incomplete decomposition of dead plant material and the very low flushing rate of the impoundment (Woodlot 2002).

Freshwater marshes with high rates of net primary productivity and low flushing rates, such as the Tinicum impoundment, have relatively short life cycles in the absence of active management. In these systems, organic matter builds up on the bottom, water depths decrease, and aquatic plants are replaced by emergent vegetation and woody shrubs. Eventually, the amount of open water habitat decreases and is replaced by shallow emergent and scrub/shrub habitat. Species requiring shallow open water are displaced in favor of other wetland species. In contrast, the tidal freshwater marshes adjacent to Darby Creek are maintained, in part, by the daily tidal flushing, which provides a mechanism for moving plant biomass out of the system through a process called production export. Such a mechanism does not exist in the East Impoundment (Woodlot 2002).

To create a patchwork of open water and shallow emergent habitat types for waterfowl brood rearing and foraging, approximately one-third of the 145 total acreage, or about 55 acres of the impoundment, would be excavated to a depth of 5 feet or greater, to limit the growth of aquatic vegetation and increase open water habitat. The dredged areas would be connected by channels of deep water to promote water movement and mixing between the pools.

One or more hydraulic dredges would be used to excavate the material from the bed of the impoundment. The dredges would pump the spoils through a discharge pipe to a land-based drying operation where the sediments would be mechanically dried and dependent on contaminant levels found in the excavated materials, disposed of on-site or loaded and hauled to an off-site location (*i.e.*, the Fort Mifflin Mud Island dredge spoils bank). The water and wet discharge from the drying units would be routed through a large, constructed sediment detention basin before being discharged back into the impoundment (Woodlot 2002).

Lastly, an interpretive sign describing the restoration project would be placed on-site at either the existing boardwalk which crosses the impoundment or at a new platform installed adjacent to the site.

2.3.3 Fill Removal at Filled Land Resource Planning Unit FL-4

This proposed restoration site is located somewhat centrally on the Refuge (Figure 3). The site was referenced in the Tinicum National Environmental Center Master Plan (USFWS 1983) as Filled Land Resource Planning Unit FL-4. This site was historically freshwater tidal wetland,

but was used as a dredge material disposal site by the Corps of Engineers until the mid-1960s. Currently, the area is minimally affected by tidal influence and is dominated by common reed, which severely limits its habitat value for wildlife.

The planning unit is approximately 56 acres in size, and would primarily involve the removal of existing fill to restore tidal wetland. The proposed restoration option would expand PennDOT's original Blue Route Mitigation project (whereby, an 18-acre portion of FL-4 was restored to tidal wetland in the early 1990s). Depth and slope of the excavation would replicate that found in the adjacent tidal marsh. As part of the excavation, common reed root masses would also be removed in hopes of reducing the amount of reed occurring at the site post-restoration (Delaware Riverkeeper Network 2006). The excavated fill would be disposed of on or off-site, depending on contaminant levels found in the excavated material.

Following excavation, dewatering (as needed), rough grading, and topsoil would be spread along the basin's banks to facilitate planting. It is anticipated that no topsoil would need to be added in the intertidal zone of the basin. Medium-duty erosion control blankets (*e.g.*, a 2-year coir and straw product with natural, biodegradable netting) would be installed to stabilize the banks and prevent sedimentation of the adjacent marsh as necessary. Anticipated earth moving equipment would include bulldozers, backhoes, dump trucks, and track- or pontoon-mounted excavators.

The banks of the basin and other areas disturbed by construction would be seeded and planted with native species for long-term stabilization and naturalization of the site. Planted species would include a variety of herbaceous species that would be visually attractive and also provide a source of seed and berry foods for wildlife. Based on experience from past restoration projects at the Refuge, it is anticipated that exclosure fencing would be needed to protect the planted stock until it is well established and less susceptible to mortality from waterfowl and deer browsing. It is assumed that the basin floor would not be planted, and that vegetation there would become established through volunteer growth. The existing seed bank and tidal flows into the basin would provide sources of seed for re-vegetation of the wetland basin, eliminating the expense of installing plants that would likely be destroyed by waterfowl (Woodlot 2002).

Lastly, a public viewing platform and an interpretive sign describing the restoration project would be installed adjacent to the site.

2.3.4 Fill Removal at Organic Filled Resource Planning Unit OF-1

This proposed restoration site is located on the western side of the Refuge (Figure 3), immediately east of State Road 420. The site was referred to in the Tinicum National Environmental Center Master Plan (USFWS 1983) as Organic Filled Resource Planning Unit OF-1. This 32-acre area was maintained as freshwater tidal marsh as recently as the 1960's, but was diked and filled during the construction of the State Road 420 Interchange along Interstate 95. This area currently contains degraded forested habitat dominated by invasive species, including: common reed, Japanese stiltgrass (*Microstegium vimineum*), and mile-a-minute (*Polygonum perfoliatum*) (Delaware Riverkeeper Network 2006).

The main component of this alternative would involve the removal of existing fill from the northern portion of this planning unit to restore freshwater tidal marsh. Fill would be excavated down to the elevation of the adjacent tidal marsh, replicating the depth and slope of the original marsh's creek and mudflat. Effective restoration of this area would require breaching of the existing dike, removing sediments along with common reed root masses, and creating marsh channels and elevations similar to those found in existing reference areas of the marsh (Delaware Riverkeeper Network 2006). The excavated fill would be disposed of on or off-site, depending on contaminant levels found in the excavated material.

Following excavation, dewatering (as needed), rough grading, and topsoil would be spread along the basin's banks to facilitate planting. It is anticipated that no topsoil would need to be added in the intertidal zone of the basin. Medium-duty erosion control blankets (*e.g.*, a 2-year coir and straw product with natural, biodegradable netting) would be installed to stabilize the banks and prevent sedimentation of the adjacent marsh as necessary. Anticipated earth moving equipment would include bulldozers, backhoes, and dump trucks.

The banks of the basin and other areas disturbed by construction would be seeded and planted with native species for long-term stabilization and naturalization of the site. Planted species would include a variety of herbaceous, shrub and tree species that would be visually attractive and also provide a source of mast, seed, and berry foods for wildlife. Based on experience from past restoration projects at the Refuge, it is anticipated that exclosure fencing would be needed to protect the planted stock until it is well established and less susceptible to mortality from waterfowl and deer browsing. It is assumed that the basin floor would not be planted, and that vegetation there would become established through volunteer growth. The existing seed bank and tidal flows into the basin would provide sources of seed for re-vegetation of the wetland basin, eliminating the expense of installing plants that would likely be destroyed by waterfowl (Woodlot 2002).

Lastly, a public viewing platform and an interpretive sign describing the restoration project would be installed adjacent to the site.

3.0 Criteria for Evaluating and Selecting the Preferred Alternative

The natural resource Trustee is required to evaluate each of the possible restoration projects based on all relevant considerations, including the following factors: technical feasibility; the cost to carry out the alternative; the extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses; the likelihood of success of each alternative; the potential for additional injury resulting from the proposed actions, including long-term and indirect impacts; the natural recovery period of the injured resources; the ability of the resources to recover with or without alternative actions; the potential effects of the action on human health and safety; and compliance with applicable Federal, State, and tribal laws. The following is our evaluation of the specific projects described above:

3.1 Effects of Alternative A: No Action

Under the no action alternative, injuries to Federal lands, migratory bird habitat, and anadromous fish, and the resulting loss of services, would not be compensated. Furthermore, no environmental benefits would be reached from the settlement with Sunoco and Publicker, and we would not fulfill our obligations as natural resource Trustee under OPA and CERCLA. For these reasons, this option was not considered further.

3.2 Effects of Alternative B: On-Site, In-kind Restoration at JHNWR

3.2.1 Fill Removal at Filled Land Resource Planning Unit FL-3

The wetland restoration measures associated with the FL-3 alternative would be feasible, practical, and would meet the goals of the Trustees in restoring natural resource injuries associated with the sites. In addition this alternative would comply with the primary goals described in the Refuge's Master Plan. Similar wetland restoration projects at the Refuge involving the removal of fill have been largely successful (*i.e.*, PennDOT Blue Route and Airport wetland restoration sites). Wetland restoration of FL-3 was identified in the Refuge Master Plan (1983), whereby NEPA compliance was fully addressed (Final Environmental Impact Statement: Master Plan Tinicum National Environmental Center, 1978) and is incorporated into this RP/EA by reference.

The restoration of FL-3 would fully compensate for injuries to trust resources by restoring habitat for migratory birds and anadromous fish, injured by the release of oil and contaminants at the JHNWR and Publicker sites. The newly restored freshwater tidal wetlands at this site would provide feeding, nesting, and brood rearing habitats for waterfowl and other migratory birds, and would provide spawning and nursery habitats for anadromous fish. The newly installed platform and interpretive sign would also benefit the public and further the recreational and educational opportunities on the Refuge.

Establishing wetland hydrology, one of the key factors in achieving successful, self-sustaining wetland restoration, would be accomplished by excavating to the elevation of the former marsh and creating a hydrologic connection to the adjacent tidal marsh. Like other portions of the marsh, maintaining the restored wetland basin will likely require a long-term commitment to controlling invasive plant species. The water control structure will provide opportunities to use non-chemical means (*i.e.*, periodic flooding and draining) for invasive plant management (Woodlot 2002).

Wetland impacts resulting from implementation of this alternative can be avoided or minimized, but are expected to be minor because there is good access to the site from either the existing trail/road or from the dike that separates the filled land from the adjacent tidal marsh. Potential fill removal activities would be facilitated by using both the dike and the trail as a means of access for excavating equipment. There are no existing underground or overhead utilities at the FL-3 site.

The project could be constructed in one season, and it is anticipated that there would be no significant seasonal constraints to contend with other than the installation of the water control structure, which should be done during the period of lowest tidal flow and also when storms and other high flow events are not expected (Woodlot 2002). The water control structure would likely be installed “in the dry”, requiring that the work area be isolated from tidal flows by temporary cofferdams or similar devices. For best results, planting would need to be done in spring or fall periods.

Known or suspected potential constraints or limitations for this alternative primarily include issues surrounding the level of contamination in the fill, which may dictate where or how fill can be disposed of. The level of contamination in the fill sediments would be assessed early in the project’s planning stages to determine the acceptable uses or disposal options for the excavated material. It is assumed, however, that the contaminant levels in the fill would be similar to what was found at the Blue Route and Airport wetland restoration sites and elsewhere on the Refuge. These soils were analyzed for almost 150 substances (including heavy metals and organic chemicals) and only relatively low-level contamination by some heavy metals were detected. Metal concentrations from these samples were not high enough to pose hazards during or after excavation (Pennsylvania Department of Transportation and Federal Highway Administration 1989). Regardless, funds have been set aside for contaminant sampling and excavated fill will be analyzed for contaminants prior to wetland construction.

Implementation of this alternative would require permits from the U.S. Army Corps of Engineers (Corps) and the Pennsylvania Department of Environmental Protection (DEP). Corps permits will likely include Section 404 (Clean Water Act) and Section 10 (Rivers and Harbors Act). The DEP will most likely require a Water Obstruction and Encroachment permit (including Clean Water Act Section 401 Water Quality Certification). Other potential approvals that may be required include a Submerged Lands License Agreement, a PA Natural Diversity Inventory Review, and a PA Historical and Museum Commission review.

The FL-3 Fill Removal alternative is cost effective, and is within the available budget of the Trustee. Estimated costs to restore FL-3 are \$1,256,040 for Option A (excavated fill would be disposed of on-site) and \$1,910,040 for Option B (all of the excavated material would be trucked off site). If Option A were selected, the remaining funds could be used towards monitoring and management of the wetland, and if Option B were selected, we would need to find additional sources of funding (i.e., grants, fundraising, funds from other natural resource damage settlements, etc.).

3.2.2 Dredging of the East Impoundment

Dredging within the impoundment is feasible but inherently complex. It would involve the use of specialized equipment for the removal of sediments from the bottom of the impoundment. Complicating factors could include: extensive permitting for the dredging and disposal of the dredged spoils, potentially severe impacts to aquatic organisms (including Pennsylvania State-

listed red-bellied turtles and coastal plain leopard frogs), and costly expenditures exceeding the available funds.

Dredging of the East Impoundment would compensate for injuries to migratory birds by providing additional open water habitat for feeding, nesting, and brood rearing activities. However, the impoundment may provide limited use to anadromous fish because 1) there is limited passage for fish into and out of the impoundment, and 2) it consists of relatively stationary water, whereas anadromous fishes are typically associated with flowing water habitats.

A cost estimate has been calculated for the dredging of approximately 55 acres of the East Impoundment. While preliminary cost estimates for construction oversight, preparation of the drying facility, loading and hauling, and reclamation can be completed at this time, the costs for dredging and dewatering cannot be accurately estimated until sufficient sampling and testing of the bed materials in the impoundment are completed.

Sampling and testing is required because the cost per cubic yard for dredging and dewatering will vary greatly depending upon the physical properties of the excavated material (*e.g.*, silts and organic materials are excavated easier than sands and gravels; however, the drying costs are greater). It can be expected that the cost would be in the range of \$10 to \$80 per cubic yard. This broad range is based on estimates provided by a dredging contractor in the Philadelphia area, and demonstrates the importance of characterizing the soils before a more accurate estimation of excavation and drying costs can be completed. Cost estimates reflecting the low and high-end expenditures for designing and implementing dredging of the East Impoundment are anywhere between \$9,531,120 and \$34,419,120 (Woodlot 2002). Due to the overall complexity of this restoration option, and because the estimated costs far exceed those available at this time, we did not select this option as the preferred alternative.

3.2.3 Fill Removal at Filled Land Resource Planning Unit FL-4

Based on previous wetland restoration efforts at FL-4 (PennDOT's Blue Route Mitigation Project), this restoration alternative would be feasible, but may be more complex due to equipment needs and site access. In addition to hauling equipment needed for fill removal, we assume that a track- or pontoon-mounted excavator would be needed to excavate the fill material from wetter areas at this site. Specialized excavators would increase project costs. Additionally, access to the site will require stabilized roads for hauling equipment. One potential would be to use the existing dike which runs along the northern portion of the site. However, public access is provided along a trail that runs the length of the dike, so restoration at this site could limit public use during construction. If the dike was not used for access to the site, a temporary earthen bridge could be constructed to facilitate access, but costs for installation of a bridge would increase the cost of the overall project.

Although wetland restoration at FL-4 would compensate for injuries to migratory birds and anadromous fish, we did not select this alternative as our preferred project because of the potential for increased costs associated with specialized excavating equipment, and because there

is limited site access compared to other available restoration options.

3.2.4 Fill Removal at Organic Filled Resource Planning Unit OF-1

Wetland restoration at OF-1 is feasible and practical. There is good equipment access to the site and it is expected that the project could be constructed in one season. However, several issues about this site preclude us from selecting it as our preferred option. Although injuries to trust resources (migratory birds and anadromous fish) would be compensated by this alternative, OF-1 is not located at the most optimal location on the Refuge, compared to other alternatives presented. OF-1 is directly adjacent to a major highway, State Road 420. Vehicular traffic associated with this highway could be a source of disturbance for some species of wildlife, particularly nesting waterfowl, and therefore waterfowl would not be as attracted to this restoration site compared to other areas on the Refuge. In addition, OF-1 is currently forested habitat. Although the forested habitat at this site is considered impaired due to the presence of invasive species (Delaware Riverkeeper Network 2006), it does contain forested cover in an otherwise urban environment, where woodland cover is sparse. Lastly, according to the Refuge Master Plan (1983), most of this area is to be maintained as forested habitat (all but the northern portion of OF-1). Perhaps managing invasive species and planting additional native species could improve the quality of this site. For these reasons, wetland restoration at OF-1 was not selected as our preferred restoration alternative.

4.0 Preferred Alternative

Based on an evaluation of the potential benefits and impacts of the various restoration alternatives, wetland restoration at FL-3, Option A (excavated fill will be disposed of on-site), is the preferred project. Trust resources were impacted by the release of oil at JHNWR and from the release of hazardous materials at the Publicker Superfund Site. By restoring tidal freshwater wetlands at FL-3, natural resource injuries to Federal lands, migratory birds, migratory bird habitat, and anadromous fish would be compensated. The newly restored wetland would provide feeding, nesting, and brood rearing habitats for waterfowl and other migratory birds, and would provide spawning and nursery habitats for anadromous fish.

5.0 Interpretation, Monitoring, and Management

During construction, a temporary sign would be installed along I-95 to inform passersby about the nature of the wetland restoration construction project. Temporary signs would also be placed along trails to inform Refuge patrons about construction activities. And as part of the preferred restoration alternative, a permanent platform and interpretive sign would be placed adjacent to the restored site to inform the public about the nature of the restoration project.

Long-term biological monitoring and management would be carried out for a period of 5 to 10 years post-construction at FL-3. Evaluation of plant survival and management of invasive species would be included as components to the monitoring and management of the restored site. Funding would be available for monitoring and management activities.

6.0 List of Preparers

This Draft RP/EA was prepared by the USFWS Pennsylvania Field Office in close coordination with JHNWR. Review of this document during its preparation was provided by the respective staffs of the Pennsylvania Field Office, JHNWR, the USFWS Northeast Region 5 Regional Office, and the DOI Northeast Regional Solicitors Office.

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